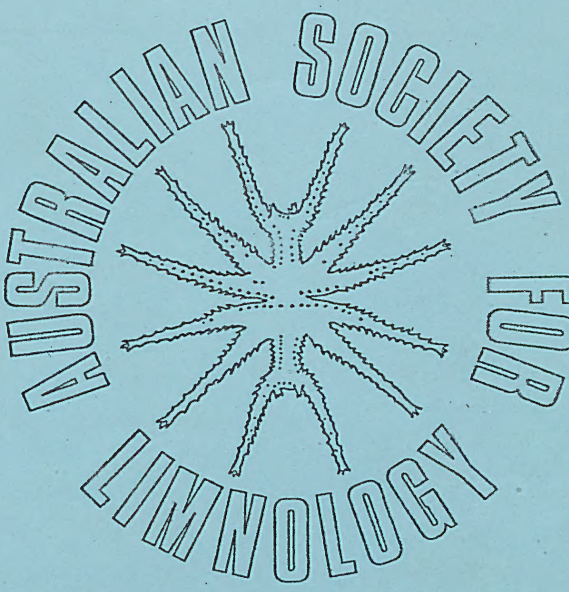

NEWSLETTER

PRIVATE CIRCULATION VOLUME 12 NUMBER 1 WINTER 1974

AUSTRALIAN SOCIETY FOR LIMNOLOGY

NEWSLETTER

VOLUME 12 NUMBER 1 WINTER 1974

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Newsletter contributions are always welcome, and correspondence should be addressed to the Newsletter Editor (see page 2). The next copy deadline is

25 September 1974

THE AUSTRALIAN SOCIETY FOR LIMNOLOGY

The Australian Society for Limnology is an association of over 200 people with professional or amateur interests relating to Australian inland waters. Since its inception in 1961, the Society has played an important role in fostering limnological work in this country. The ASL also promotes liaison between limnologists in academic, private, and governmental institutions, and has a vested interest in the conservation of aquatic and related resources. Annual congresses are held near centres of limnological interest, and the program includes scientific sessions, field excursions, and social activities.

The ASL publishes a Bulletin, containing scientific articles, a Newsletter, containing notes on society activities, articles of general interest, book reviews, and congress announcements. A further periodical publication is the Directory of Australian limnologists. Special publications are issued as material becomes available.

Membership applications are welcomed; four classes of subscribing membership are catered for:

- Ordinary Members ($6 pa)
- Student Members ($3 pa)
- Sustaining Members ($50 pa or more)
- Affiliated Bodies (fixed annually)

Subscriptions cover the period 1 July-30 June.

Details are available from:

Mr D.E. Buckmaster
Hon. Sec./Treasurer ASL
Fisheries and Wildlife Division
Arthur Rylah Institute
123 Brown Street
HEIDELBERG, Victoria 3084.

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THE THREAT OF ELODEA

The Irrigation Research and Extension Committee of the Murrumbidgee Irrigation Area and nearby areas has recently circulated a letter to academic institutions in eastern Australia, expressing their concern at the recent appearance of the macrophyte Elodea canadensis in the channel systems of the area.

Elodea is already established on both sides of the River Murray, and its infestations are causing considerable reduction in channel flow. There is a very real possibility that the weed may become established in all water systems of eastern states. Elodea is a native of North America, and has spread to many parts of the world. It is commonly cultivated as an aquarium plant, and this is probably the source of the outbreak in the MIA. In Australia, unlike its native habitat, Elodea tends to assume complete dominance once established. It is very resistant to herbicides, although limited success has been obtained using acrolein aromatic solvents and dichlobenil.

Presently the only research on the problem is directed at testing herbicides as potential control agents. The Committee is therefore anxious to interest other workers in the biological and economic aspects of the plant, hopefully leading to development of a full-scale research project.

The Committee would like to hear from anyone who may be interested, either individually or as a student project supervisor. They may be contacted at the address below.

c/- Irrigation Research Lab.
CSIRO
Griffith, NSW 2680.

NOOSA THE LAST CONGRESS

To Noosa came a great event:
A meeting in a circus tent.
Many limnologists and their kin
- marine biologists, fisheries men -
mixed freshwater and foamy brine,
so the meeting's theme was estuarine.
On such things one day was spent
to everyone's enlightenment.

Later on the annual dinner
proved to be a social winner,
even though the morning after
there were faces drained of laughter!
On this day the meeting parted;
concurrent sessions then were started.
This went on till four PM,
and was followed by the AGM.

Whereupon McMichael did present
a report by the President.
Hiscock and Walker both exhorted
that local research should be reported.
Remember also Martin's gripes
about our insect holotypes?
And Wharton told of problems posed us
by goldfish and furunculosis.

Came the time to vote anew
for who is honoured this time through.
The lovely Joan did give consent
to be first lady President.
Tyler's now in charge as vice;
there could not be a better choice.
And the job of money master
falls again to Don Buckmaster.

Next day there was a morning cruise,
and for others coastal views.
Then came the time for our departure -
buses, planes, all on charter;
many left by different routes,
cases packed with tropical fruits ....

BUT

Without Mike and Liz there could not have been
an ASL Congress number thirteen.

Thanks Mike, Liz.
Thanks everyone who helped.

* * * * * * * * * * *

NEWS OF THE XIV CONGRESS

The ASL Congress in 1975 will be held in Canberra over the weekend of 9-12 May. Lecture facilities will be available at the Department of Forestry, ANU, and accommodation will be available either on campus or nearby. At Burgmann College, for example, full board costs about $13.50 daily (single), and limited accommodation for couples will be available. The annual dinner will be at Burgmann College on the Saturday night. On the Sunday, early plans are for a field trip, perhaps a boat cruise on Lake Burley Griffin, and a meal at the Gundaroo Hotel, about 25 km from the city. The cost at Gundaroo will be about $7.50 per head, providing the Society is able to guarantee a minimum attendance of 100. If sufficient people are interested, group travel to Canberra from Sydney and Melbourne may be arranged. A good time is guaranteed for all - more news as it comes to hand!

ASL DIRECTORY OF LIMNOLOGISTS

Plans are afoot to produce an updated version of the ASL Directory of Australian limnologists. A questionnaire form is interleaved in this issue of the Newsletter. Please be sure to complete the form and return it as early as possible to ensure your name is not ommitted!

WHAT IS THAT ON THE COVER?

Micrasterias hardyi West is an attractive desmid first described from a collection of plankton from Yan Yean Reservoir, Victoria, where it still occurs plentifully. It has since been found in several lakes in Tasmania, and appears to be abundant and widespread in Victoria and New South Wales. M. hardyi is evidently endemic to Australia and this, combined with its beautiful symmetry, makes it an appropriate adornment on the cover of the Newsletter. More in the next issue!

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(b) the development and mangement of water resources so that, where practicable, other purposes such as flood mitigation, power generation, recreation and improved wildlife habitat are achieved in parallel with the purposes referred to above.

(c) the development of waste water treatment facilities in conjunction with water supply systems and the encouragement of recycling and reuse.

(d) implementation of a program of public education and involvement aimed at ensuring on the one hand a proper understanding of public responsibility in the use and management of water, and on the other hand an acceptance by all relevant authorities that the public have a right to involvement, and a contribution to make, in the planning and management of water enterprises.

(e) the allocation of costs so that wherever feasible the user pays the full cost attributable to him, on the basis of appropriate cost allocation techniques.

(f) irrespective of the details of cost allocation, the adoption of water pricing policies which enable needs to be met at a fair and reasonable cost, but which provide an incentive to all water users to avoid wasteful or environmentally harmful practices.

(g) the continued development of policies and practices, as far as possible consistent throughout Australia, aimed at achieving appropriate water quality objectives, and the highest practicable level of pollution abatement.

(h) the inclusion in these policies of the general objective that direct costs, or costs related to loss of amenity, attributable to pollution should be borne by the polluter. Although the immediate and full adoption of this principle may not be feasible, it is nonetheless a goal to be pursued.

(i) the zoning of flood-prone land, with a view to its orderly management.

(j) the maintenance of an adequate sample of undisturbed sample of undisturbed aquatic environments as reference areas and the preservation of appropriate wetlands for the benefit of native wildlife.

In addition to these generalities, some specific actions have been taken which have considerable significance for limnologists. One was the establishment of a Committee of Inquiry into the flooding of Lake Pedder, which in its preliminary report recommended the committment of some $8 million, plus a possible additional $30 million or more, to reverse the flooding of the lake, partly on the grounds of its scientific importance. That the Australian Government eventually decided to accept this recommendation was an important event, since it showed that the national government was prepared to commit very large sums of money to maintain or restore environmental quality. That the Tasmanian Government subsequently rejected the offer is only an indication that environmental awareness is not yet a characteristic of all governments in Australia.

Another important event was the decision of the Premiers of New South Wales, Victoria, and South Australia, and the Prime Minister, to establish a working party to examine the problems of salinity and other aspects of the River Murray, with a view to recommending any changes which may be necessary

in the role and powers of the River Murray Commission. Although there has been reluctance on the part of at least some states to open up the study to include comprehensive investigations of land-use in the tributary valleys (which is clearly fundamental to any comprehensive study of the water quality of the Murray itself), nevertheless there is increasingly a recognition that mangement of the main stem cannot be divorced from management of the tributary streams and adjacent lands, and I believe that eventually we will look at Australia's most important river system comprehensively - as a total system requiring coordinated management. Meanwhile limnologists have been significantly involved in the studies undertaken so far.

At the same time, questions were asked as to the desirability of proceeding with construction of Dartmouth Dam on the Mitta Mitta River. After a reasonably comprehensive study of available information, it was concluded that the building of the dam would have greater beneficial effects, especially in terms of water quality control, than adverse effects, and it is expectedthat letting of the tender for the dam will soon be authorized. Again limnologists have played an important role in assessing the effects of the dam on the river, and hopefully their views will influence both the design and operations of the storage.

A further example of the changing philosophy of the Australian Government was the decision to refuse, at this time, agreement to proceed with the Alwest bauxite mining project in Western Australia. Again concern for water quality was one of the significant factors which caused the Government to ake this decision, even though it was a politically unpalatable one. Similarly, environmentally influenced decisions were made in relation to the proposed Pike Creek Dam on the NSW-Queensland border, and the Googong Dam on the Queanbeyan River near Canberra.

I would also like to mention the decisions of the Government to continue with the program of financial assistance for Water Measurement by the States, and could add that it seems likely that the program will be extended in the near future to cover water quality. This support for basic data collecting, coupled with the renewal of the Water Research program for a further three years with increased funding, is indicative of the recognition by both the Australian and State governments of the need for better information about water, its behaviour and management in Australia, and cannot but be welcomed by limnologists.

In the international sphere, Australia continued to play a part in the various organizations concerned with water resources. As a member nation in the Organization for Economic Cooperation and Development (OECD) Australian delegates were active in the Environment Committee and especially its Water Management Sector Group, which has been making important contributions to knowledge of such problems as eutrophication and water quality measurement and control. A number of Australian limnologists have been involved in these studies.

Australia is also a member of the Governing Council of the United Nations Environment Program (UNEP). At the meeting of the Governing Council held in Nairobi in March, an action program was agreed upon, in which water studies feature prominently. Several major areas of concern were identified-including Human settlements, Land, Water and Desertification, the Oceans, Conservation of Nature, Wildlife and Genetic Resources - and what is known as the Earthwatch program. The latter involves the development of global environmental monitoring systems and will be designed to measure the state of various environmental parameters with a view to giving early warning of any changes which are likely to be adverse. Again, the quality of the earth's

water resources will feature prominently in GEMS activities.

Thus at both the natioanl and international level, concern for water resources generally is increasing, and limnology is assuming an importance which would have been unthinkable when the society was founded fourteen years ago. For these reasons we can, Ibelieve, expect that our science will flourish, and that in doing so, it will contribute significantly to the improvement of man's well-being, and to the maintenance of the world's ecosystems in all their diversity and in a healthy state.

Society affairs

I do not propose to deal with the affairs of the Society generally - that I leave to our distinguished Secretary-Treasurer. I would however like to mention four things.

First, at the last Annual General Meeting it was decided that we should explore the prospects of holding a joint meeting with our New Zealand sister society. Your Executive did this, but regrettably while they indicated that Australians visiting New Zealand at the time of their planned Annual Meeting in May would be welcome to attend, they were unable to arrange for a separate meeting in January 1974 that would be mutually convenient and interesting to both groups. Consequently, it was decided to abandon the proposal for this year, but to recommend that the idea be pursued for a subsequent year. I suggest that such a meeting would need to be planned two years in advance to be successful.

Second, it was suggested that there could be merit in arranging a joint meeting with the Australian Marine Sciences Association. In this case there was a ready response from AMSA, subsequently joined by the Australian Society for Fish Biology, and the Conference we have just concluded was the outcome. Whether or not it was successful I leave to you to judge. However I would like to say that I, for one, do not believe that we should repeat the experiment for some years. The ASL has been a successful group for many years now, precisely because it has brought together, in one place each year, most Australian limnologists to talk together about their chosen field of science and to enjoy eachother's company. While many of us are also members of AMSA and we enjoy meeting and talking with our marine colleagues, we would not want to see the special "inland waters" emphasis of our annual congress altered by a significant influx of seawater on each occasion. However, in my view, there has been a mutual benefit from this joint meeting - we have discussed in depth a topic which has relevance to both societies, and one which is all too frequently neglected by each of them. May I suggest to you that we should consider another joint meeting such as this in about five years time?

Third, I would like to remind you of the decision taken at the last Annual General Meeting to provide for a new category of Sustaining Membership, especially in order to gain regular financial support for our publications program. Because of the increasing cost of printing and the relatively depleted state of the Society's funds, it was decided that we could not afford to print a Bulletin this year, though with the inflow of subscriptions for the new financial year, sufficient money should soon be available and we hope the next issue will appear shortly. However, I believe that it is desirable that the Society's Bulletin should appear annually, and this could be assured if we had a body of sustaining members, say 20 organizations each contributing $50 a year. In order to encourage growth in all our classes of membership as well as sales of our publications, we have produced a brochure

about the Society, including tear-off application for membership and publications order forms. We hope that members approve of the design of this brochure (which was done by Mrs Julie Pfeiffer of Sydney) and especially the Neoceratodus emblem which I think might well be adopted by the Society for all its publications and letterhead. I hope that every member of the Society will try to persuade his or her employing organization, or any other person or company with whom the member has contact, who might be interested in the Society, to consider becoming a Sustaining Member.

Fourth, at the last Annual General Meeting you endorsed the Executive Committee recommendation to establish the Jolly Award, to be presented to a person who has made a significant contribution to limnology in Australia. It gives me great pleasure to announce that on the recommendation of the Selection Committee, the Executive has agreed that Dr Alan Weatherley, now Professor of Fisheries Biology at the University of Tromsø in Norway, should be the first recipient of the award. I do not have to recount to you the very real contribution which Alan Weatherley has made over many years to Australian limnology - and to this Society, of which he was President in 1965. Alan has advised me that he is honoured to accept this distinction, and will let us know the name of a book which he would like to have as the Jolly Award for 1974. I am also very pleased to announce that Dr Hilary Jolly has contributed yet another $50 to the fund for the award, bringing the total to $150, less whatever amonut is spent on this year's award.

Finally, I would like to say how much I have enjoyed my term as President of the Society for these last twelve months. I have enjoyed working with my colleagues on the Executive Committee, and I hope that what we have been able to do during this year has been of benefit to the Society and to limnological science.

D.F. McMichael
President
12 May 1974

'THE ASL BULLETIN NEEDS YOUR SUPPORT'

FERTILIZERS AND THE ENVIRONMENT

[A symposium held by the NSW Branch of the Australian Institute of Agricultural Science at Wesley College, University of Sydney, 13-15 May 1974. This report was prepared for the Newsletter by Roger Croome.]

The mis-spelling of "environment" in the sign directing those registering for the symposium was not an indication of things to come - environmental considerations were paramount and the symposium certainly was a very useful one, if only to point out where knowledge is lacking and research is most needed.

The symposium was in three sections - one on nitrogen, one on phosphorus, and another with potassium and heavy metals. Thirteen papers were presented by people from various Commonwealth and State organizations and institutes. Introductory papers, including "Fertilizers:a resource not a penalty", and "Phosphorus bioeconomics", were followed by papers on the behaviour of nutrients in the soil - "Nitrogen-soil interactions", "Physico-chemical factors controlling the gain and loss of phosphate from the soil/plant system" - papers on increasing the efficiency of fertilizers, and on the loss of fertilizers to the environment and their effects, e.g. "Heavy metals in fertilizers - environmental implications", and "Phosphate-fertilizer residues in streams and lakes".

One day was taken up by three concurrent workshops; these were designed to answer certain questions relevant to the Australian environment and to suggest what further research is required. Discussions included (a) the fate of fertilizers in terms of plant uptake, soil fixation, and losses to the environment under different cropping systems, (b) increase of fertilizer efficiency to increase that proportion absorbed by the crop and to reduce the proportion fixed by the soil or lost to the environment, (c) alternatives to inorganic fertilizers, and (d) the adverse effects of fertilizer losses on the Australian environment, with special reference to streams and lakes.

The nitrogen workshop determined that little is known of the local situation, and that a survey should be made of all problem areas. Preliminary experiments should be on uniform micro-catchments and small crops. Suitable areas for study would be the Murrumbidgee Irrigation Area, the Ord River valley and other intensive horticultural areas.

The phosphorus workshop discussed losses via leaching and runoff. Losses were thought to be insignificant in agricultural terms (ca. 0.10 mg/l), but highly significant in limnological terms. Concern was expressed at the possible build-up of phosphorus in aquifers, where the build-up would be virtually irreversible, and would not show up for many years. It was said that condensed phosphate fertilizers of the future would not release to the environment any more phosphorus than the orthophosphate fertilizers do.

Superphosphate is the only fertilizer applied in Australia that has heavy metal contaminants (largely cadmium). Fortunately, the levels of cadmium in the major source of rock phosphate in Queensland are low by world standards.

The proceedings are to be published in the Institute's Journal in November.

EUTROPHICATION STUDIES IN AUSTRALIA

by Ian Smalls

MWSDB, Sydney

[This paper soon is to be formally published in the proceedings of a symposium, "Water pollution and the environment", held on 20-21 May 1974 at UNSW to commemorate the Golden Jubilee of the Technion (Israel Institute of Technology, Haifa), as an activity of the Australia-Israel Scientific Exchange Program. It is reproduced here, in draft form, with kind permission of the symposium organizers, the Technion Society and UNSW, and of course Ian himself!]

Introduction

Eutrophication may be defined as the natural or artificial addition of plant nutrients to water and the effects of such addition. The nutrients most commonly associated with the eutrophication problem are nitrogen and phosphorus, while locally there is good evidence that phosphorus is the nutrient often limiting in infertile waters.

Initially the term eutrophic was used with respect to inland standing waters; however more recently it has been applied to all types of inland waters, together with fiords, estuaries, and marine bays (1,2).

The antonym of eutrophic is oligotrophic and some workers have created an intermediate state termed mesotrophic, while those with a strong splitting desire have divided the mesotrophic condition into alpha and beta phases.

Effects of eutrophication

Although there are some benefits from eutrophication, for example fertilizing to promote algal growth is widely used in fish farming practice in Asia, attention is mainly directed to the adverse effects. These effects may be summarized as

1. Increased algal growth problems

   (a) water supply problems: These have been detailed by Smalls (3), and may be categorized as follows

   Taste and odour problems in drinking water.
   Modification of the pH of the water.
   Increased colour and turbidity.
   Clogging of waterworks filters and impact on other treatment processes.
   Interference in some industrial and domestic processes.
   Quality variation in water supplies.
   Toxin production.

Increased organic load on the distribution system. Unaesthetic growths on waterworks structures. Algal development may result in growths of other [problem organisms.

(b) aesthetic problems: The appearance and odour of algal mats may affect the recreational use of the water.

(c) algal decomposition: This may result in the deoxygenation of water. The depleted oxygen levels may lead to fish kills and production of unpleasant odours such as hydrogen sulphide. Production of this gas led to the discolouration of house paint along the shores of Lake Erie (4).

(d) There may be direct toxicity problems from algae causing problems to fish and stock watering. A review of this problem has been given by Schwimmer and Schwimmer (5).

2. Higher plant (weed) growth problems

(a) Blocking of waterworks screens and other problems similar to those encountered with algal growths.

(b) Choking of waterways, increasing flood problems and hindering navigation.

(c) Intereference with recreational pursuits.

3. Direct toxicity of nutrients

There have been several cases, as reported by Walters (6), where high concentrations of nitrate and nitrite ions have given rise to methaemoglobinaemia in young bottle-fed babies.

4. Effects on animals

Eutrophication may bring about changes in the general faunal composition. Changes in fish populations have occurred where economically desirable species have been replaced by undesirable coarse fish. The American Great Lakes have shown this salmonid to coarse fish change, although this is not only due to eutrophication, but also to the introduction of the sea lamprey and to over-fishing effects.

The eutrophication problem in Australia

The eutrophication problem in Australia is probably not of the same order of magnitude as overseas, particularly as that pertaining to North America and Europe. This is partly as a result of the dryness of Australia, as the Senate Select Committee on Water Pollution (7) stated, "Water is a scarce and valuable natural resource, more scarce in Australia than in any other continent". Consequent upon this aridity there is less permanent standing water in Australia than in other continents.

In addition to the lack of water the problems of sewage nutrients inducing eutrophication are lessened by the local pattern of coastal urbanization, with its history of sewage disposal to the sea.

However, the problem of eutrophication is likely to increase in Australia. In the past major cities often drew water from deep reservoirs constructed in infertile catchments; as demand for water increases, sites with developed agricultural catchments are being utilized, often with shallower, more productive reservoirs.

Such a pattern of development has occurred in the Sydney area; the oligotrophi reservoirs of the completely protected metroploitan catchments are being supplemented by potentially eutrophic systems in the new Shoalhaven scheme, where catchments are already subjected to intensive agricultural usage.

There are therefore an increasing number of Australian man-made lakes in situations potentially liable to give rise to eutrophication of the standing water. This local problem is being further compounded by the increasing decentralization of the coastal urban population to the interior.

Australia is also a continent where many soils are impoverished in essential plant nutrients. To compensate for this some 4 million tons of superphosphate are applied annually and the crops resulting from such a high fertilization feed some 40 million people, vastly in excess of our population of some 13 million. However, Australia does not use large quantities of nitrogenous fertilizers, and instead there is a reliance on the nitrogen-fixing properties of legume crops.

Application of overseas studies to Australia

There is a uniqueness of Australian inland waters and this has been well-described by Williams and Wan (8). This uniqueness, some aspects of which are itemized below, may preclude the direct application of the results of overseas studies to the local situation.

Ionic composition

Australian natural waters often have higher total dissolved solids levels than overseas. There is often a different composition with relation to ionic dominance; even in major reservoirs such as the MWSDB storage of Lake Burragorang the cationic dominance of Na > Ca > Mg > K is different to the dominance of Ca > Mg > Na > K of many European lakes.

Bushfires

Bushfires followed by heavy rains represent an important nutrient transfer from terrestrial systems to the aquatic environment. The impact of bushfires in late 1968, when some 15.4% of the total catchment area of the Sydney Board's reservoirs was burnt, is reflected in changes that took place in the algal standing crop of Lake Burragorang, as illustrated in Table 1.

River flows and nutrient concentrations

Australian rivers usually have very widely varying flow rates and nutrient concentrations. A common occurrence is for 95% of the total flow to occur in less than 5% of the time, which is especially significant if the river feeds a lake or reservoir. The eroding effects of high flood flows are associated with high nutrient levels; the opposite situation pertains in many European rivers where floods usually dilute nutrients from constant point sources.

The situation of higher nutrient levels in flood flows is illustrated by studies on the Upper Georges River, NSW, above areas of urbanization. The average total phosphate-P for 1972 was 0.014 mg/l; on 19 January 1972 the level was 0.013 mg/l and during a flood on 2 February it rose to 0.391 mg/l. A rapid drop in the river level on 9 February was accompanied by a drop in total phosphate-P to less than 0.002 mg/l.

Table 1. Total algal cells/ml from composite 0-4.5 m samples, Lake Burragorang (site 3D).

year	maximum	minimum	mean
1965	1268	59	273
1966	1267	41	320
1967	1757	82	407
1968*	861	72	231
1969	5472	94	1140
1970	5717	262	1802
1971	5029	444	1935
1972	6043	372	1989
1973	5432	196	1774

*bushfires in late 1968.

Urban runoff

The large home building blocks of Australia, the heavy domestic use of fertilizers and a level of lawn watering that sometimes matches flood irrigation levels, suggest that the total phosphate-P runoff level from urban areas of 0.9 kg/ha/yr quoted overseas (9) may be exceeded locally.

Solar energy input

Recent International Biological Program work (10) has shown that globally, variables related to nutrient concentrations may have a lesser influence on primary production than variables related to solar energy input. Most Australian waters are in warmer latitudes than those extensively studied overseas.

Overseas eutrophication study areas

The previously quoted IBP work (10) typifies the areas where most eutrophication studies have been carried out overseas. There has been little study in the 20 to 40° latitude zone in the northern hemisphere, the area equivalent to that occupied by much of Australia. It is however worthy of note that typical summer temperatures for the Sea of Galilee, Israel, given by Wachs (11) as 28° surface and 14°C bottom are similar to those of Lake Burragorang, NSW, which are typically 26°C and 13°C respectively. Israeli studies may therefore be of greater comparative value than those of cool temperate zones.

The need for local studies

Owens and Wood of the UK Water Pollution Research Laboratory (12) stated that information on chemical, physical, and biological characteristics of water,

on the nutrient requirements of algae, and on the various system nutrient inputs would be necessary before economic decisions for the removal of nutrients from effluents could be made.

It is apparent that local studies are needed to justify projected control measures, whether these be nutrient removal from sewage, the banning of phosphate builders in detergents, or other means of nutrient control. It is hoped that these studies, including system nutrient budgets and the effects of nutrient levels on primary production in local waters, will be made before costly decisions are made on nutrient control.

Local eutrophication studies

There has been little work reported on eutrophication or its effects in Australia, although one of the first reported cases in the world of toxic algae poisoning stock was that of Francis (13) in 1878; this detailed a Nodularia (blue-green) bloom in Lake Alexandrina, South Australia, which affected sheep, horses, dogs, pigs, and cattle.

Recent papers in Australia, including Williams (14), Hartwell (15), and Cullen (16), have mainly been reviews of the world situation with relatively few examples of local studies.

Even the Senate Select Committee on Water Pollution (7) devoted only two paragraphs to the problem of eutrophication, one of which dealt with the situation in the United States. The general paragraph on local conditions dealt only with fertilizer effects and not with other sources of nutrients such as sewage effluents.

Initially, Australian studies centred around the Universities of Tasmania and Monash, and water authorities in Adelaide and Sydney. In 1972 the Australian Water Resources Council funded a research project on the assessment of eutrophication in Australian inland waters. A project officer has recently been appointed, and is attached to the Department of the Environment and Conservation, Canberra.

The water supply authorities, E & WS, South Australia, and the MWS & DB, Sydney, have become involved in the Organization for Economic Cooperation and Development (OECD) eutrophication monitoring programme. OECD studies include system nutrient budgets and their relationship to primary production in lakes and reservoirs.

There are now an increasing number of studies being initiated in Australia, including large-scale studies on the River Murray through the auspices of the Cities Commission; by the CSIRO Division of Land Use Research and through water supply undertakings in Victoria, NSW, and Queensland. In addition major environmental studies such as those on Port Phillip Bay and Westernport (17) have a large component directed to nutrient budget and primary production studies.

Objectives of an Australian eutrophication programme

The programme should attempt to identify eutrophication with regard to local conditions. An understanding of the local situation will enable a more efficient application of overseas studies and their results to be made.

The programme might attempt to disseminate to a wider base the knowledge (for example on problems and methods) gained from Australian participation in the OECD eutrophication programme.

The programme should attempt to coordinate research being undertaken in Australia on eutrophication, with the result that

(a) standardized methods will be used that yield results of comparative value, thus assisting in the management of water bodies, and
(b) any problems encountered would be easily discussed and hopefully avoided in future investigations.

Conclusions

Although the eutrophication problem may never be as significant in Australia as overseas, mainly due to the present pattern of coastal urbanization, it is a problem worthy of identification with regard to local conditions. It is especially important to gain a full knowledge of the local situation, including system nutrient budgets, before the expensive control measures are initiated.

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* * * * * * * *

WHY BAN THE IMPORTATION OF GOLDFISH?

by Jim Wharton

Fisheries and Wildlife Division,
Victorian Ministry for Conservation.

Several freshwater fishes in Australia are described commonly as goldfish. One of these is the European carp (Cyprinus carpio) which is currently spreading cancer-like in the south-eastern waters of our continent. The importation of this fish to Australia is already prohibited. The other two goldfishes (Carassius carassius and Carassius auratus) I lump together because hybridization has made them very difficult often to distinguish. They are not prohibited imports.

All three goldfish made their debut in Australia in the 1870's and, while the European carp has extended its range dramatically only during the last decade, the other two species have been widely distributed for many years. They probably became established in the wild through deliberate releases by fish fanciers who hoped to improve the aquatic environment according to their own standards or to save the life of an ailing aquarium pet.

In the aquarium trade, goldfish, in their often grotesque form and colour varieties are far and away the most popular single species. The demand for them is met by production at farms in New South Wales and Victoria and by importations. In 1973, about 600,000 goldfish were imported from Japan and other countries and some 1,200,000 were bred locally.

Since about 1963 there has been a growing demand by fisheries workers to ban the importation of goldfish and I would now like to attempt to explain this attitude.

The specific objective of the proposed ban on goldfish is to prevent entry of the disease organism causing furunculosis. The malady gets its name from the furuncles or boil-like lesions which it produces on affected fish. It is the "foot and mouth" disease of fish culture and where stocks of fish in a hatchery become affected, drastic remedial measures such as burning the entire stock and liming ponds have been and still are adopted. Quite apart from the furunculosis organisms, there are many external parasites carried by carp which are believed generally to be absent from Australia.

Unfortunately, we cannot be absolutely sure that furunculosis is not already in Australia. There is, however, a good argument to support the view that it is not here. The probability that wild fish are disease-free is based on the fact that the external symptoms of furunculosis are gross and unpleasant-looking and the likelihood that any sick or dead fish seen by anyone would have been drawn to the attention of fisheries or health authorities. No such reports are known. In the case of hatchery fish, the effects of the disease are so dramatic and economically disastrous that an outbreak at any commercial operation would inevitably attract great attention. Such is the nature of this disease.

The fisheries argument for a ban is simple; the longer we allow the importation of goldfish to continue, the more likely we are to receive fish carrying the furunculosis organism. One obvious question arises: Why are sick fish not detected at the port of entry to Australia? The answer here is quite straightforward. It is usually not possible for the responsible authority to arrange a thorough inspection of fish. Moreover, fish may show no external symptoms of furunculosis whatever. To be absolutely sure that a fish is furunculosis-free, blood-sampling and culturing is necessary and in many cases this would kill the fish anyway. Another question which is often asked is: Why can't the exporting country give a certificate stating that consignments of fish are free from diseases? The answer here is that the study of fish diseases is a relatively new science and most health certificates are not worth the paper they are written on.

The only relatively weak link in the argument to ban goldfish is the possibility, even the probability, that a sick goldfish carrying furunculosis released into a stream by a lamenting hobbyist would die before making contact with other goldfish or other susceptible fishes, and that the disease would not therefore become established. An often-used counter to this point is the question: Why take any risk when the potential harm arising from the action is catastrophic?

We tend to think only of the ten or so Government and private trout hatcheries and farms in Australia as being at serious risk from furunculosis. We should think also of our fine native fishes such as Murray cod, Golden Perch, Macquarie perch, Barramundi, and others, all of which may be susceptible to furunculosis and all of which may some day be at risk in Government and commercial culture operations.

One interesting aspect of the matter which is worth mentioning is that the great majority of aquarium dealers in Australia prefer locally bred stock to imported animals, despite the fact that they may be several times the price. The reason for this is that the locally produced fish are of much superior quality than the imported animals. It is not uncommon to have a large percentage of imported fish die within a few days of their arrival in Australia. Most responsible aquarium dealers leave imported fish alone in aquaria for at least a week in order to allow sick fish to die (or recover) before attempting to make any sales.

It was mentioned earlier that the number of goldfish bred in Australia in 1973 was about twice the number imported in that year. In earlier years imports were much higher than local production and the reason for this change is because goldfish growers in this country have been anticipating for several years that a total ban would be applied to the importation of goldfish, and they have responded by increasing their crops. Unfortunately, there will always be a number of "backyard" dealers and owners of small aquarium shops who are attracted first by the relatively low price of overseas goldfishes and who are not so concerned about the quality aspect. Moreover, there is a seasonal shortage at a time of year when the output from farms in south-eastern Australia is very low and at this time importation is the only significant source of supply.

A total ban on the importation of goldfish implemented over a two or three year period in order to give the industry a chance to gear itself to the situation would undoubtedly see a further expansion of goldfish breeding in New South Wales and Victoria, and probably also the development of ponds in Queensland which would meet the seasonal deficiency we experience in the south.

The most important thing about a total ban on goldfish importation is that it would be a very positive step towards safeguarding our freshwater fishes and the industries which have developed, and will later develop, around them from a particularly damaging disease.

INSECT EXPORT RESTRICTIONS

by Jon Martin

Department of Genetics,
University of Melbourne.

[Jon's comments are in two parts: first, a general outline of arguments for and against the Government regulation (13A), and secondly a reply to the reaction of the AGM at the recent Noosa meeting. The attention of members is also drawn to an article, "On the regulation and export of insect specimens", published by F.H. Talbot and C.N. Smithers in Search 5,233-5; these authors share Jon Martin's concern. The reaction of ASL members is requested, and a questionnaire for this purpose is interleaved in this issue of the Newsletter.]

PART ONE : SUBMISSION TO THE AGM

In July of last year the Government promulgated a new regulation (13A) under the Customs Act, which requires a permit be issued before any insect, spider or tick, whether living or dead, is exported from the country. In the case of material on loan or exotic material there is no restriction on the issue of a permit, but in the case of material of native insects which are not intended for ultimate return to Australia, a permit will not be issued unless the intended recipient has signed a Holotype Declaration which binds them to return all holotypes of Australian material which come into their possession subsequent to signing the declaration.

The sole purpose of this regulation is to ensure that holotypes of Australian species are lodged in Australian museums. It was introduced by the Government after a request from the Conference of Australian Museum Directors who took this action without informing any groups of professional entomologists. In fact when professional entomologists had been queried on this question in 1963 a substantial majority was opposed to such legal control, although less than half of those queried sent a reply.

The Australian Entomological Society is currently conducting a survey to ascertain the feelings of members and so determine what action should be taken and, since many of our members also work with insects, I believe it would be appropriate for the ASL to also consider its attitude to this question with a view to deciding whether it should make any official approach to the Governmant requesting alteration or abandonment of this regulation.

Although I personally am against this regulation, I will attempt to be fair by giving the reasons in support of the regulation as well as the points which have been raised in opposition.

THE CASE IN FAVOUR

1. A large number of Australian insect species still remain to be described. It is highly desirable that the holotypes of such species should be lodged in Australian museums so that they are readily available to Australian researchers, who will be doing the bulk of future work.

2. A voluntary or negotiated return of holotypes has proved unsuccessful. Some overseas institutions, such as the British Museum, have statutes preventing holotypes designated from amonst their collections being lodged anywhere else.

3. The Holotype Declaration must be a blanket type requiring return of any future designations of holotypes for two reasons: (a) to cut down the administrative load of requiring a new declaration for each shipment, and (b) major collections may not be completely studied for over 50 years.

4. The regulation must also apply to live material because it has often happened that such material is incorrectly identified or contains undescribed species as a contaminant. As a result holotypes may be designated which must be returned to Australia.

5. Australia is an isolated piece of land and therefore tends to have a largely endemic fauna.

THE CASE AGAINST

1. Very few scientists would disagree that it is desirable that the majority of Australian holotypes should be lodged in Australia. They may well disagree that all should be. Opponents of the regulation often take the view that holotypes are not property of any one country, but rather the property of the international scientific community. As such they should be lodged where that community can make the best use of them. For the majority of Australian insects this would presumably be in Australia, but may be somewhere else such as the Bishop Museum in Hawaii, which has specialist collections of Pacific insects. For this reason they cannot condone the new regulation.

2. The regulation assumes that the Australian fauna is unique and endemic, which it is not. Many insects which occur in Australia also occur in other countries. These countries have as much claim to these holotypes as does Australia. It is quite possible that some other country may be much more centrally located for storage of the holotype. The obvious example is the Bishop Museum in Hawaii which has large collections of Pacific insects, and the holotype of any insect which occurs throughout the Pacific as well as in Australia might well be more usefully located in this collection.

3. Some overseas institutions (e.g. British Museum) have refused to sign the holotype declaration because it contravenes their statutes. Such institutions can now only receive loans or paratypes. Because they cannot get export permits for any material they collect, the British Museum has cancelled several proposed visits. This will seriously restrict work on some sections of the Australian fauna and restrict collaboration between Australian workers and those in the British Museum.

4. The necessity for a permit before living material can be sent causes delays which can have serious consequences where insects with short life cycles are concerned. In particular the recipient, who may have little or no interest in taxonomy, must sign a holotype declaration before a permit will be issued. All this in case a small number of holotypes escape the country.

5. The regulation cannot effectively be policed. The customs authorities are not competent to determine whether the package contains the specimens listed on the permit. This, of course, only becomes a problem if Australian workers decide to sidestep the regulations by wrongly declaraing them for the purposes of obtaining a permit. A much more serious criticism is that once out of the country there is no way that it can be ensured that holotypes can be returned. The individual or institution may be blacklisted for the future, but by that time they may have all the available material anyway.

In my view these arguments against the regulation are much more compelling than those in its favour. I believe the regulation is both unworkable and undesirable. Therefore I would propose that the ASL should write expressing an opinion that Regulation 13A be rescinded.

PART TWO : REPLY TO THE AGM

When the above information was presented to the AGM at Noosa, there was general feeling that members wanted more time to consider the proposal, particularly as some members felt that this was a matter of restricted interest which should be left to the Australian Entomological Society to deal with. I cannot agree with the latter view since I consider that there are two important and closely related aspects to which the ASL could well give consideration. These are

1. As scientists, can we agree <u>in principle</u> to the legislative control of the disposition of holotypes, regardless of whether they are insects, fish, or <u>Homo sapiens</u>?

It has already been mentioned that opponents of the export control regulations claim that holotypes are the property of the scientific community and not of any particular country. They quote Article 72(f) of the International Code of Zoological Nomenclature in support of their argument. This states: "Value of types - Holotypes, syntypes, lectotypes, and neotypes are to be regarded as the property of science by all zoologists and by persons responsible for their safe-keeping".

2. This regulation sets a precedent for legislative control of holotypes of Australian species which could ultimately be extended to all groups of animals, and conceivably also plants. Certainly there already are restrictions on the export of most vertebrate species but, so far as I am aware, the issue of a permit does not depend on the signing of a holotype declaration by the recipient of the specimens.

Therefore, although the ASL may well feel that the question of whether the export of insects should be controlled can be left to the Entomological Society, it could, and I believe should, address itself to the the question of whether

there should be legislative control of the disposition of holotypes.

To this end a questionnaire form is interleaved in the Newsletter. Would you please take a minute or two to complete and mail this so that we may obtain a clear indication of the feelings of members?

GUIDELINES FOR THE CONTROL OF THE EXPORT OF INSECTS (INCLUDING TICKS AND SPIDERS) FROM AUSTRALIA

1. A regulation (13A) under the Customs Act 1901-1971, promulgated on 19 July 1973 (Statutory Rules 1973 No. 138), provides that the export from Australia of "live or dead insects (including ticks and spiders)" is prohibited except with the approval of the Minister for Science, or a person authorized by him.

2. Persons designated by the Minister for Science to approve the export of insects under this regulation are listed in the attachment to thses guidelines (not included here).

3. A person wishing to export insects from Australia should submit to an authorized person an application for an export permit on the Australian Customs Form G64, Restricted Goods - Export Permit, obtainable from the Department of Science (PO Box 449, Woden, ACT 2606) or from any of the authorized persons. The application should specify whether the insects represent (a) a loan made to a reputable overseas institution or person, (b) the return of a loan, the property of an overseas institution or person, (c) insects not native to Australia, (d) paratypes, or (e) specimens other than the above.

4. In the case of 3(a) to 3(d), if the authorized person is satisfied that the specimens are as stated, he will approve the export and return the permit. If the consignment falls into category 3(e), he will approve export only if the intended overseas recipient has lodged with the Department of Science, on a form obtainable on request from that Department or from any authorized person, a blanket declaration that all holotypes that may at any time be designated from among any insects received by him or his institution from Australia after 19 July 1973 (other than borrowed insects being returned) will be lodged in an Australian museum, or in the Australian National Insect Collection. A schedule of persons and institutions whose declarations have been accepted will be maintained by the Department of Science and circulated to all authorized persons. Copies of the schedule may be obtained on request from the Department.

5. Thus persons within Australia who wish to export insects in category 3(e) above should ensure, before entering into any contractual arrangement, that the intended overseas recipient has fulfilled the requirement. In the absence of this an export permit will not be issued. Overseas persons or institutions proposing to collect insects in Australia for lodgment overseas should similarly ensure, before making any other arrangements, that they are qualified to receive an export permit by having lodged the required declaration and been notified of its acceptance.

NEW AND FORTHCOMING PUBLICATIONS

Bayly, I.A.E. A new species of Hemiboeckella (freshwater Copepoda, Calanoida) from Western Australia. Rec. W.A. Museum.

Neale, I.M. and I.A.E. Bayly. Studies on the ecology of the zooplankton of four estuaries in Victoria. Aust. J. mar. Freshwat. Res.

Bayly, I.A.E., E.P. Ebsworth, and H.F. Wan. Studies on the lakes of Fraser Island, Queensland.

Paterson, C.G. and K.F. Walker. Seasonal dynamics and productivity of Tanytarsus barbitarsis Freeman (Diptera: Chironomidae) in the benthos of a shallow, saline lake. Aust. J. mar. Freshwat. Res. 25, 151-65.

Paterson, C.G. and K.F. Walker. Recent history of Tanytarsus barbitarsis in the sediments of a shallow saline lake, with consideration of the distribution and salinity tolerance of the species.

Croome, R.L. Nitrogen fixation in the algal mats on Marion Island. S. Afr. Tydskrif vir Antarktiese Navorsing 3, 64-67.

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De Deckker, P. Australocypris, a new ostracod genus from Australia. Aust. J. Zool. 22, 91-104.

Lake, P.S., R. Swain, and J.E. Ong. The ultrastructure of the fenestra dorsalis of the syncarid crustaceans Allanaspides helonomus and Allanaspides hickmani. Z. Zellforsch. 147, 335-351.

Walker, K.F. The stability of meromictic lakes in central Washington. Limnol. Oceanogr.

Knott, B. and P.S. Lake. A brief survey of the macro-invertebrate fauna of Lake Edgar and its immediate environs (south-west Tasmania). Suppl. to Tas. Nat. 36.

[Sam tells me the above reprint costs $1 and is available from the Tasmanian Field Naturalist's Club, Box 68A, GPO, Hobart.- Ed.]

*The NSW Water Conservation and Irrigation Commission will very soon be issuing a report on the water resources of the Murray Valley, as part of its series on 32 NSW river valleys.

Walker, K.F. The River Murray and man in ecological perspective. Dept. Adult Education, Univ. Adelaide.

Hillman, T.J. Comparison of materials for enclosure of samples during in situ primary productivity measurements. Aust. Soc. Limnol. Bull.

AUSTRIAN LIMNOLOGY

Madame President visited Vienna in April and spent some time with the limnology group of the University's Zoology Department. Most of their work is concentrated on Neuseidler See, a very large, shallow lake south-east of Vienna. Its waters are turbid and slightly saline, and the lake itself is eutrophic. There are extensive Phragmites beds along the margin and in the centre of the lake, and these support interesting bird populations. All aspects are being studied, but particularly water movements, fish migration, colonization of the Phragmites beds, and benthos and zooplankton. Professor Heinz Löffler is presently writing a book on the lake.

The Department has a field station, established in 1906 at Lunz, in a beautiful area south-west of Vienna. A past Director of the station was Professor Franz Ruttner, and his daughter-in-law, Dr Agnes Ruttner-Kolisko, is now in charge. There are three lakes at Lunz: Untersee, one of the four Austrian lakes included in the OECD Alpine Lakes Eutrophication Study, Obersee, above the field station and extremely beautiful - Joan had to cut her way through snow drifts on her climb up to Obersee, and on arrival could not see a thing for snow and mist; she has since been shown a photograph! - and Mittersee, halfway up the hill.

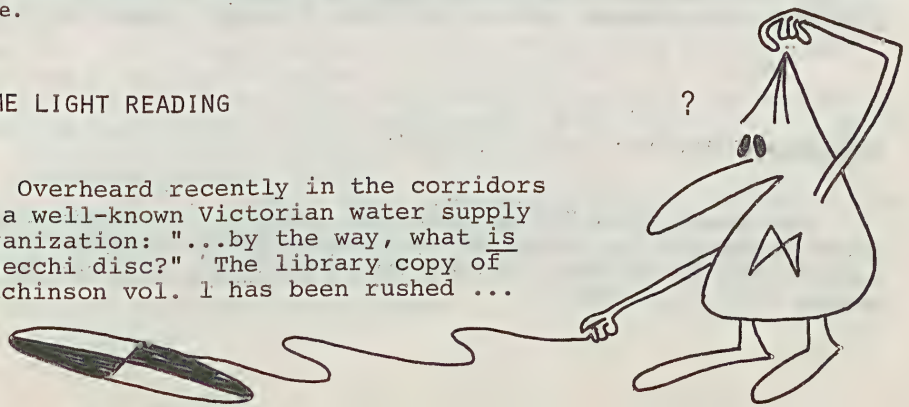
Another OECD lake is Attersee (not far from Salzburg) and here, in a small village, an old schoolhouse has been let to the limnologists by the Mayor. Several government departments are cooperating in the overall study; other lakes in the project are in Carinthia (near the Italian border) and near Innsbruck.

Joan reports a devious plot to convert her into a dedicated carp eater, as she was for ever being confronted by plates of fish soup and fish fried, grilled, stewed, and boiled - all equally delicious and with the same basic ingredient, Cyprinus carpio. The secret is to eat the smaller carp, not the huge animals that decorate the marble slabs at local fish markets, and to keep the fish in freshwater for 2-3 days before killing them; this removes the "muddy" flavour to some extent.

The Austrian limnologists were extremely interested in Australian work, and would be interested to have closer contact with their counterparts here.

SOME LIGHT READING

Overheard recently in the corridors of a well-known Victorian water supply organization: "...by the way, what is a Secchi disc?" The library copy of Hutchinson vol. 1 has been rushed ...



OSTRACOD HOLOTYPES!

A much-travelled collection of ostracods has recently returned to Australia after a prolonged stay abroad, mainly in the Austrian capital of Vienna. The ostracods left Australia primarily to escape taxonomic anonymity but, after all these years of waiting unsuccessfully to be named, they decided to return to their homeland and cleverly arranged to stow away on a Sydney-bound Boeing, stuffed in the toes of a visiting limnologist's boots. Having left us known simply as Löffler A and Löffler B, they are hoping soon to have names of their own. Presently in Melbourne, they will shortly be sent on to Paul De Deckker at Macquarie University in NSW. Paul, incidentally, is very keen to obtain specimens of the large ostracods from saline lakes, particularly from NSW. He is at the School of Earth Sciences.

UNIDENTIFIED FLOATING OBJECTS

These "UFO's" are Cladophora balls which, when broken open are seen to consist of a mass of tangled filaments rather more twisted and branched than the normal strands found in both lentic and lotic waters. The theory of their formation is that they roll around on the surface of a sandy or other substratum and hence develop a spherical shape. In Europe they are typical of calcareous lakes but are found in a variety of habitats, usually along the shoreline or on the bottom of the lake or swamp. Sometimes, perhaps seasonally, oxygen production by the algal filaments is so great they rise to the surface and float.

A small, shallow, and extremely saline swamp (TDS 29 g/l) on the coastal strip between the Bunga Arm of the Gippsland Lakes and the sea is the only known Victorian record. This material has been sent on to Dr J.W.G. Lund of the Freshwater Biological Association in England, and he is interested in more material.

Please notify Joan Powling at SRWSC in Victoria of any sightings, past or future!

A BIBLIOGRAPHY OF AUSTRALIAN LIMNOLOGY?

Peter Tyler and Keith Walker have been giving some thought to producing a bibliography of Australian limnology, perhaps as a special publication of the ASL. Although both have extensive card files that will go a long way towards doing the job, they would greatly appreciate contributions of reference lists, however local or restricted in scope. Please let us know.

ANZ HARPACTICOIDS

Dick Hamond of the Zoology Department, University of Melbourne, is gathering material for a monograph of the harpacticoids (copepods) of Australia and New Zealand. He would greatly appreciate any preserved samples from inland waters.

VIGINTI SEPTIMUS MILLIARIUM TASMANIENSIS

Governments have their five year plans, historians their millenia, universities their triennia, Tasmania its Premier. Limnologists at the University of Tasmania's Botany Department generally work to a system governed by the number 27. How so?

It started by the water still as Rod was rinsing flasks for phosphorus analysis. "How many rinses?" "Twenty seven." "Why?" "Ah, because Mr Gladstone always chewed every morsel of food 27 times. The new Middle Gordon storages will be 27 times the capacity of Sydney Harbour. Japanese bombers raided Singapore in formations of 27, Sir Thomas Armstrong used the word "grass-roots" 27 times in one evening's debate in the House of Commons, and when that tricolor railway guard's lantern came into our possession, it naturally bore the copper numerals DP27. And our Secchi disc is 27 inches in diameter; our plankton nets, tieid to the leg by a 27-foot cord, are always thrown and hauled 27 times. It's fundamental, dear boy."

And so with their twenty-seventh publication, the Tasmanian chapter comes of age; a bibliography is given below. A party to be held in Hobart on October 27 will celebrate the occasion and Rod's twenty-seventh birthday.

Good on yer, cobbers.

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ACF REFERENCE COMMITTEES

Twenty leading Australian scientists, including at least five ASL members, have agreed to serve on three Reference Committees which will advise and assist the Australian Conservation Foundation in matters relating to limnology, oceanography and estuarine ecology, and terrestrial ecology.

ASL members comprising the Limnology Committee are Ian Bayly, Sam Lake, Noel Morrissy, Dave Pollard, and Peter Tyler.

OUR MAN IN COORANBONG

Although Brian Timms has missed the last two Congresses, he wants it made known that he is alive and still digging into lakes. He is spending winter (well, seven weeks) in north Queensland examining the bottoms of Lakes Barrine, Eacham, Euramoo, and other maars, as well as looking at lava field lakes to the north-west of Charters Towers. The expedition's purpose is to compare the benthos of these lakes with data on volcanic lakes in western Victoria. On the way south Brian hopes to go overland by Lakes Buchanan and Galilee, to check that Bayly and Williams did not leave anything behind. Brian is steadily accumulating material that should permit a monographic treatment of the benthos of Australian lakes.

PROFILE

DR TOMI PETR is a recent arrival at the Department of Zoology, Monash University, and brings to us a wealth of overseas limnological experience. Tomi is a Czech who went to Ghana during Nkrumah's time, and decided to stay on there after Nkrumah's fall. He worked for a while on Volta Lake and then moved to Makerere in Uganda, where he spent about three years. Prior to going to Monash, he was at Lunz for a short period.

Tomi has not yet fully decided on his future research work in this country, but will probably be concerned with benthos communities, particularly the ecology and taxonomy of Chironomidae. He is also interested in the carp problem, and may look more closely at this fish, perhaps in the River Murray, where it is presently causing so much concern. Generally, however, Tomi's interests in fish and tropical limnology are very much alive, and he would like to participate in any type of tropical research in Australia or nearby countries.

A summary of Tomi's limnological background follows and, to complete this profile, a publications list is presented overleaf for the information of members.

1957-1962

Czechoslovakia - macrozoobenthos and pollution of various streams; biological indicators of pollution and their use in determination of water quality.

1964-1970

Ghana - Volta Lake: establishment of benthos in this man-made lake; changes in fish populations during the early stages of impoundment; biology of Povilla adjusta, an ephemeropteran nymph that burrows in submerged grass and wood; benthic fauna of the Volta River; taxonomy of African Chironomidae.

1970-1973

East Africa - pre-impoundment study of the Great Ruaha River in Tanzania, with special refernce to fish; studies of two impoundments in Tanzania (Lake Nyumba Ya Mungu and Hombolo Dam); invertebrate fauna of fringing Cyperus papyrus swamps of Lake Victoria and its relation to the lake ecosystem; taxonomy of adult Chironomidae of some mountain lakes in SW Uganda; identification of survey and research priorities concerning the development of fisheries in the Kagera River Basin in Rwanda, Burundi, and Tanzania.

There certainly will be a number of ASL members eager to counsel Tomi on the opportunities that exist here for a man of his experience. All members will hope that Tomi's stay in Australia, for however long, proves to be both rewarding and enjoyable.

* * * * * * * * * * * * *

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THE AUSTRALIAN CONSERVATION FOUNDATION

* The ACF is anxious to attract new members.

For information: The Director
Australian Conservation Foundation
206 Clarendon Street
East Melbourne, Vic. 3002

The annual subscription for ordinary members is $5; a voluntary levy of an additional $3 entitles the member to receive special publications of the ACF.

PALYNOLOGY IN THE SNOWY MOUNTAINS

Ian Raine (Biogeography & Geomorphology, R.S. Pac. Sci., ANU) is presently writing up his Ph.D. thesis, entitled "Pollen sedimentation in relation to vegetation history in the Snowy Mountains". Ian's work has centred on Blue Lake, where he has obtained lake sediment cores C-14 dated back to 12,600 years BP. Pollen and spore infulx into the lake has been investigated by trapping in the atmosphere and in the lake, and by collection of snow and water samples. Results of this modern process study are being used in interpretation of pollen diagrams from Blue Lake and Twynam north-east cirque. Preliminary results suggest that the alpine area was revegetated after the last glaciation before 13,000 years BP, but that conditions were rather cool and dry until about 9000 years BP when there was an increase in precipitation and possibly also temperature. Since then precipitation and temperature appear to have declined, with a marked drop at about 3000 years BP.

MARRON IN WESTERN AUSTRALIA

Noel Morrissy (Fisheries and Fauna, WA) continues to look at pond breeding and rearing of freshwater crayfish (marron, Cherax tenuimanus) in Western Australia. Since 1969 juvenile marron have been reared in ponds at Pemberton for one or two years after spawning, maternal care, and release from the parent in each spring-summer period. The 1970-1971 year class was recently reared through to three years of age, and the majority of females spawned for the first time. Of these, 75.8% (119) mated and 116 became fully berried. Of the young released from these feamles in early January 1974, 2820 were recovered in an inventory in late March, virtually re-establishing the initial number of 2980 juveniles present three years before (which provided the 1973-1974 brood stock).

It is therfore possible to perpetuate captive stocks of this species of freshwater crayfish. A second spawning of surviving females at a larger size next spring should provide a similar number of young again; these can be used for other than future brood stock, e.g. commercial production.

A small number of the three year old pond-reared males were cooked and found, by a range of local gourmets, to have the usual very high standard of edibility of wild marron!

STUDENTS AT MONASH

Ian Bayly (Zoology, Monash) has a number of students working on limnological and estuarine topics. Graeme Arnott (Ph.D.) is also with

Ian, and expects to submit his thesis on the zooplankton of Port Phillip Bay in the very near future. Valerie Hilton (nee Macreadie) is doing a Ph.D. on the ecology of zooplankton in Anderson's Inlet - an estuarine impoundment in Gippsland - with special reference to species of the copepod Gladioferens. David Morton (M.Sc.) is looking at the taxonomy and ecology of cyclopoid copepods in Australian inland waters. Russell Shiel (B.Sc.Hons.) is studing variations in a littoral microcrustacean community in a billabong, in relation to different types of weed bed. Another Hons. student, Garry Davey, is concerned with effects of increasing salinity on the diversity of animal populations in the Altona salt works.

ENERGETICS OF PARARTEMIA

Richard Marchant (Zoology, Monash) is a Ph.D. student with Bill Williams. Since July 1973, Richard has been studying aspects of the energetics of the brine shrimp, Parartemia zietziana, in two saline lakes (L. Cundare and Pink L.) near Colac, western Victoria, and aims to develop energy budgets for the species using field and possibly laboratory data. Work to date includes quantitative sampling to determine population densities and growth, and also in situ respiratory rate measurements. Richard writes: "At the start I had a number of problems when trying to take quantitative samples. The most serious was the large variance in the densities of shrimp throughout each lake, sometimes ten-fold differences in the numbers per square meter. I have overcome this as well as possible by reducing the size and increasing the number of samples, and by stratifying samples; this is a statistical devicewhich enables any patterns in the distribution of shrimp to be taken into account in estimating the sampling error. In the two lakes the greatest population densities were found near the shore of the lake to which the wind was blowing. These procedures reduce the 95% confidence limits of the mean from approximately 100% when 2 or 3 samples are taken at random, to 30-50% when 12 to 16 (i.e. 3-4 per shore or stratum) are taken. Although this error is large, to reduce it to the 10% level generally recommended would mean about 140 samples from each lake.

"From samples at intervals of about 4 weeks I have been able to calculate population densities per square meter, measure weight and growth, and distinguish the various cohorts. In general, there are only a few major cohorts. Production is calculated by integrating a plot of the size of each cohort against mean individual weight for each sample. Results so far suggest that Pink Lake, with the highest average biomass of the two study lakes, has a shrimp production of roughly 10 g dry weight per square meter per year; this, however, is a minimal estimate.

"I have also tried to measure respiratory rates in situ to obtain a field measure of assimilation (respiration + production). By enclosing shrimp in BOD bottles for 0.5-1 hr and measuring oxygen (Winkler) at the beginning and end of this period I can estimate the volume of oxygen consumed per hour per individual. There are a number of problems with this method, although it is widely used. The most serios is that handling of some aquatic animals before enclosing them temporarily increases their metabolic rate. However, I think that in my lakes the shrimp always are respiring maximally because of the low oxygen concentrations (due to high salinity) and the fact that they generally are actively swimming. Data show relationships similar to

those of other animals, in that log respiratory rate is proportional to log individual weight. Unfortunately, this trend is somewhat obscured by the effects of the high summer temperatures and salinities.

"To complete the budgets I need estimates of the rate of ingestion or assimilation efficiency. It is not possible to do feeding experiments in the field because pure algal samples cannot be taken, and at present I'm trying to culture algae from the lakes in the laboratory.

"I am also interested in the effect of predation on the dynamics of the shrimp populations. The major, and probably the only, predator seems to be the silver gull, Larus novae-hollandiae; on each trip I've been counting the number of gulls seen on each of the two lakes."

EUTROPHICATION ASSESSMENT IN AUSTRALIA

An assessment of eutrophication in Australian inland waters is the latest project of the Australian Water Resources Council. The project officer is Gavin Wood, a newcomer to Australian limnology, who is hastily applying for membership in the ASL!

During the year Gavin plans to survey Australian and overseas information on eutrophication as completely as possible. Emphasis will be on bringing together the details of the Australian scene and the project will be aimed at throwing light on questions such as what eutrophication is, what the problems are, where they are, what is being or can be done in the management of these problems, and what are the future research needs.

Gavin plans to visit as many as possible of the people who are working in the eutrophication field, but doubtless some people with useful information will be overlooked and Gavin would appreciate it if they would contact him if they believe they have something useful to contribute. In this way the project will be made as meaningful as possible. It is hoped that the project will produce results of use to all connected with water and eutrophication in this country.

Gavin Wood
Eutrophication Project Officer
Australian Water Resources Council
c/- Department of the Environment & Conservation
PO Box 1937, Canberra City, ACT 2601.

LAKE GINNINDERRA

Lake Ginninderra is the second lake to be built for aesthetic reasons in Canberra, and a further lake is planned in the satellite city of Tuggeranong. Lake Ginninderra is of biological interest for several reasons. Firstly, its catchment consists of the northern end of the ACT and at present

is almost entirely rural, but in the very near future most of the area will be built over. Secondly, the lake will serve as a heat sink for air-conditioning plants associated with buildings of the Belconnen city centre. Heated and intermittently chlorinated water will be pumped into the lake.

Several projects are underway in the Department of Zoology and the Department of Environmental Biology (RSBS) at ANU. Keith Walker is collecting data on water quality from lake water samples, and from samples of tributary and drainage waters from the already urbanized areas. Tim Marples and a group of students are studing Aufwuchs production in the same tributaries, and the effects of heat and chlorine on zooplankton. Studies are also planned on the effects of heat and chlorine on primary productivity in the lake.

NORTH PINE RIVER DAM EUTROPHICATION STUDY

The Department of Biology and Environmental Science of the Queensland Institute of Technology has been commissioned by the Queensland Co-ordinator General's Department to study the factors contributing to possible eutrophication of the North Pine River Dam impoundment. Those involved in the study are W.A. Dodd, C.R. King, M.K. Ross, and J. Wilson; what follows is their report on the progress to date.

"The study commenced in October 1973 and will continue for an initial period of three years. Lake Kurwongbah, adjacent to the North Pine River Dam, has been an established water supply for about 15 years and has been included in the study for comparative purposes.

The North Pine River Dam, which is approximately 15 miles north of Brisbane, is being constructed and will be operated by the Brisbane City Council. At permanent water supply level, the impoundment surface area will be 2,144 ha, and the storage capacity will be 2.57×10^8 cubic meters. The North Pine River Dam is expected to be completed during 1974 and the impoundment will probably reach permanent water supply level during 1975.

Objectives of the study

The main aim of the study is to monitor changes in the North Pine River Dam ecosystem and to use the resultant data for predictive purposes, culminating in a management program for the impoundment and the catchment area. Data are being collected in the following areas:

* Survey of the catchment area.

(a) Water quality of the streams is being monitored to determine the quantities of organic and inorganic materials contributed by major divisions of the catchment area. The patterns of seasonal water quality changes are being monitored and any sources of pollution investigated.

(b) Biological communities of the streams - the objectives are to determine the species likely to colonize the dam, to determine the importance of the streams to life which will exist in the dam, and to locate sources of pollution from changes in community structure.

(c) Vegetation and land use is being studied to determine the effects of past and present land use and vegetation patterns on nutrient input to the dam.

Progress during the first six months

Water samples have been collected from fifteen sampling points in the catchment streams. Samples were taken at 21 day intervals with additional samples during heavy rains. The lake formed by the North Pine Dam filled to the first level with the recent summer rain. Water samples have been taken from five points on the North Pine Dam and from three points on Lake Kurwongbah. All water samples have been analyzed for 19 parameters including important nutrients.

Collection of biological specimens from the streams and both lakes is continuing. As yet taxonomic work is in the preliminary stages. Primary and secondary productivity studies on the impoundment were started in June 1974.

Data handling

1. All water quality data is stored on disc file in an ICL computer. Programs have been written to retrieve data in any of the following ways:

   (i) plot any combination of parameters in 2 dimensions.
   (ii) plot any combination of parameters in 3 dimensions.
   (iii)determine the correlation between any combination of parameters.

2. Biological community and productivity data will be analyzed using appropriate programs.

Predicted eutrophication patterns

To date a considerable body of data has been collected but analysis is not at a sufficiently advanced stage to allow much more than informed guesses about the future patterns of development. The data are unfortunately too lengthy to present here.

On the basis of water analysis, it would appear that the waters of the North Pine River Dam impoundment and the established Lake Kurwongbah are chemically quite similar in terms of major ions. However, Lake Kurwongbah, which has been established for about 15 years, is now eutrophic and contains higher levels of nitrogen and phosphorus than the North Pine River Dam impoundment. At this time it might be predicted that the North Pine River Dam impoundment will undergo eutrophication which can be expected to be most rapid in one particular arm of the impoundment which is shallow (average depth less than 5 m) and very poorly mixed with the rest of the lake.

It is hoped that a documented report on this study can be presented at the next ASL Conference."

QUICKIES

Karl Shearer (Inland Fisheries Research Station, Narrandera) has commenced work on the carp Cyprinus carpio, and is including a food preference study of carp and native fish species.

Terry Hillman (Environmental Biology, RSBS, ANU) is now writing up his Ph.D. thesis on primary productivity in Lake Burley Griffin, and expects to be free again in late September.

DARTMOUTH DAM PROJECT

Several members of ASL are currently involved in various aspects of the Dartmouth Dam project in Victoria. Dr Brian Smith and his staff of the National Museum are continuing their aquatic invertebrate survey as part of the ecological study, and are now involved in the detailed examination of collections from 18 sites downstream of the dam site on the Mitta Mitta River. Don Buckmaster of Fisheries and Wildlife is in charge of the fish survey of the river from Lake Hume to a point well upstream of the dam site, and Bill Graham of SRWSC is leading the group responsible for the chemical and physical analyses of the Mitta Mitta and its tributary streams.

In addition a specialist committee has been set up to consider the effects on native fish of the altered flow regime following construction of the dam, and to investigate the possibility of introducing more flexibility into the operating procedure to enable release of water at selected temperatures, according to the season of the year. ASL members on this committee are Jim Wharton (Chairman), Ian Bayly, John Lake, Don Buckmaster, Brian Smith, Bill Graham, and Joan Powling.

MIDGES AND FROGS

Two taxonomic keys that may be of interest to members will be included in the next issue of the Newsletter. Jon Martin has prepared a key to genera of Australian Tanypodinae larvae (Diptera, Chironomidae), and Bob Humphries has put together a key to frogs and tadpoles of the ACT.

Suppose you own a pond on which a water lily is growing. The lily plant doubles in size each day. If the lily were allowed to grow unchecked, it would completely cover the pond in 30 days, choking off the other forms of life in the water. For a long time the lily plant seems small, and so you decide not to worry about cutting it back until it covers half the pond. On what day will that be? On the 29th day, of course. You have one day to save your pond.

D.H. Meadows et al. 1972
The limits to growth
(Potomac Associates: New York)

FIFTH MEETING, 1 MAY 1974

Arthur Rylah Institute for Environmental Research, Vic.

1. Present
   Dr D.F. McMichael
   Mr D.E. Buckmaster
   Dr J. Martin
   Ms I.J. Powling
2. Apologies
   Dr D.A. Pollard
   Dr I.D. Hiscock
   Dr W.D. Williams
3. Minutes of fourth meeting: read and confirmed, subject to alteration of item 4(c) - prices of ASL publications - as outlined in last Newsletter.
4. Business arising:
   (a) Unfinancial members: Sec./Treasurer to inform members still unfinancial that their membership rights are now forfeited as outlined in the Constitution (clause 6).
   (b) Funds for Bulletin 6: After a scrutiny of the Society's accounts, it appears that a sum of approximately $1,000 will be available for publication of Bulletin no. 6. Sec./Treasurer to inform Dr I.D. Hiscock of this fact.
   (c) Bank accounts: Sec./Treasurer reported that the Society's accounts are now in an appropriate condition, i.e. all lodged at same bank (ANZ), and a separate Jolly Award account erected.
   (d) Affiliated bodies: Sec./Treasurer undertook to provide a listing of all such bodies for the AGM.
   (e) Amendments to the Constitution: no notice of intention to amend the Constitution has been received to date, and therefore no amendments can be formally debated at the forthcoming AGM.
   (f) Explanatory leaflet: The President reported that the leaflet is now ready for printing, and 1,000 copies should be available before the AGM.
   (g) Jolly Award: The Award Selection Committee has made a recommendation for the Award, and details will be announced at the AGM, following receipt of an acceptance by the nominee.
5. Correspondence:
   All items tabled and noted; action on some items as follows:
   (a) Australian Natural History Medallion: Sec./Treasurer to inform Selection Committee that the ASL will maintain its nomination of Dr E.F. Riek for 1974.
   (b) FORWOOD Conference: Sec./Treasurer to reply to correspondence from FORWOOD Conference organizers re non-representation of ASL at meeting.
   (c) Macquarie Island Advisory Committee: Sec./Treasurer to provide copies of the Committee's prospectus re participation in next summer's program by research scientists.
   (d) ASL library: Letter received from R. Tilzey re this matter will be drawn to attention of the incoming Executive.
   (e) Resignations: Letters of resignation have been received from Dr A. Racek and Dr R. Strahan; these have been acknowledged.
6. Accounts for payment:

see over

The following accounts were passed for payment:

$3.50	Dr B. Smith	(stencils)
4.00	Dr M. Geddes	(Congress expenses)
25.40	Dr M. Geddes	(Congress expenses)
150.00	Mrs J. Pfeiffer	(art work for information leaflet)
16.15	Mr D. Buckmaster	(general expenses)

7. General business:

(a) New members: seven new members have joined the Society since the last meeting. Full details of new members will be circulated in the near future.

(b) Joint Congress: The President outlined organizational details for the Congress, including formal programs for the presentation of papers and excursions on the Monday. The Committee ratified a proposal that ASL and AMSA agree to share equally any net profit or loss arising from the Congress. It was noted that both time and accommodation would be at a premium due to the interest being shown in this year's joint function. The program is summarized as follows:

Saturday	0900 - 1740 hrs	presentation of papers with ESTUARIES as the central theme.
	1900 - ?	annual dinner.
Sunday	AM	two concurrent sessions of joint interest
	PM	AGM's for each society from 1600 hrs onwards.
Monday	0800 - 1200	limited excursion to selected sites or full day excursion by boat on the Noosa Lakes.

(c) Customs Act: It was agreed that Dr J. Martin should submit this item to the AGM as part of General Business.

8. Next meeting: to be held at Noosa Lakes Motor Inn, 2030 hrs, Friday 10 May 1974. All members of the Executive Committee are requested to attend if possible.

FIRST MEETING, 12 MAY 1974

Noosa Lakes Motor Inn, Qld.

Present: J. Powling (President), P. Tyler (Vice-President), D. McMichael, S. McCallum, N. Milward, K. Walker, R. Humphries, K. Shearer, J. Dean.

Apologies: D. Buckmaster, M. Geddes.

General Business:

1. ASL Bulletin: Dr I.D. Hiscock re-elected as editor; J. Powling, D. Pollard, and I. Bayly elected as editorial board. Dr Pollard agreed to pursue general question of solicitation of Bulletin material, including dispatch of letters to possible contributors. It was also agreed that members of the Executive should make an effort to obtain suitable contributions for the Bulletin , and inform Dr Pollard accordingly.
2. Newsletter: Dr K.F. Walker re-elected as editor.
3. Jolly Award Selection Committee: Re-elected as follows: Dr D.F. McMichael, Mr J. Wharton, Mr D.D. Lynch.
4. Publicity in Search magazine: It was agreed that Dr McMichael would act as the Society's correspondent to this magazine.

5. Directory: It was agreed that telephone numbers and STD codes should be included in the next Directory if possible.
6. XIV AGM: This will be held in Canberra in May 1975, during University Vacation as usual. Dr K.F. Walker to convene an organizing committee which should include D.F. McMichael and R.B. Humphries.
7. Bookplate: It was agreed that D. Pollard and R. Tilzey should attempt to make progress in the design and production of a suitable bookplate.
8. Jolly Award - Dr A.H. Weatherley: It was agreed that the publication nominated by Dr Weatherley should be purchased and forwarded to him as soon as possible.
9. Honorary memberships: It was agreed that Committee members should bear in mind the fact that, under the Constitution, suitable persons can be nominated for honorary membership either for a restricted period or for life.
10. Sustaining membership: It was agreed that Committee members should pursue the recruitment of sustaining members. Such members must be acknowledged in all Society publications.
11. Next meeting: to be held at Albury in late June/early July.

Meeting closed 2130 hrs.

D. BUCKMASTER
Hon. Sec./Treasurer

SECOND MEETING, 26 JUNE 1974

Dartmouth, Victoria (NB: Minutes unconfirmed at present)

Present: J. Powling (President), P. Tyler (Vice-President), D. Buckmaster (Sec./Treasurer), D. Pollard, K. Shearer, S. McCallum.
Apologies: D.F. McMichael, I.D. Hiscock, K.F. Walker
Minutes of 1st Executive Committee Meeting: Read and confirmed. Sec./Treas. to circulate to all absent committee members.

Business Arising:

1. Bulletin: Sec./Treasurer to provide full break-down of costs etc.; other procedures as outlined in minutes to continue as agreed therein.
2. Newsletter: It was noted that the Editor has implemented a new cover design; it was agreed that the new design was most effective, and that any extra costs involved in production of future Newsletters would be in order. It was agreed that Dr Tyler would ask the Editor to include reminder re Bulletin material in next Newsletter, and the Sec./Treasurer would design suitable questionnaire re next Directory for inclusion in the Newsletter. It was also suggested that Newsletter should give early advice of proposed date of next AGM (9-12 May 1975).
3. Directory: Sec./Treasurer will compile Directory this year as agreed earlier; should be ready for publication by end of August.
4. XIV AGM: Committee confirmed Canberra as venue, and fixed tentative date as 9-12 May 1975. It was noted that Dr Walker will not be able to convene an organizing committee as initially proposed.
5. Bookplate: still in progress.
6. Correspondence: letters from FORWOOD and the Selection Committee for the Australian Natural History Medallion tabled and noted.

Accounts for payment: the following accounts were passed for payment:

1.	K.F.Walker	$4.80	(General expenses)
2.	Sunshine Coast Coaches	$120	(Bus Hire, Noosa)
3.	AMSA	$10	(ASL contbn to entertainment costs)

An account for $4371.00 from East West Airlines was passed on the proviso that the Sec./Treasurer contacted D.F. McMichael to clarify some discrepancies before payment actually was made.

General Business: General discussion ensued on the matters of importation of goldfish into Australia, and the export of insect material. It was agreed that these matters should be referred to the next committee meeting, together with appropriate background papers not available at the time.

Next Meeting: date and venue to be finalized, and full committee to be advised well in advance.

Meeting closed 1730 hrs

D.E. BUCKMASTER
Hon. Sec./Treasurer

THE ASL BULLETIN NEEDS YOUR SUPPORT

The factor limiting the production of the Bulletin is no longer financial, but a lack of suitable material! Please give some thought to any material of your own that might be suitable for inclusion. Only through support of people like yourself can the Bulletin prosper. Address any editorial correspondence to the Bulletin Editor:

Dr I.D. Hiscock
Department of Zoology
Monash University
Clayton, Victoria 3168.

D.R. BUCKINGHAM
Hon. Sec./Treasurer